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ABSTRACT

This student module on walking and working surfaces is one of 50 modules concerned with job safety and health. This module describes safety requirements for floors, stairways, ladders, and scaffolds, as well as OSHA standards for the construction, use, and maintenance of each of these. Following the introduction, nine objectives (each keyed to a page in the text) the student is expected to accomplish are listed (e.g., List two signs of an overloaded floor). Then each objective is taught in detail, sometimes accompanied by illustrations. Learning activities are included. A list of references and answers to learning activities complete the module. (CT)

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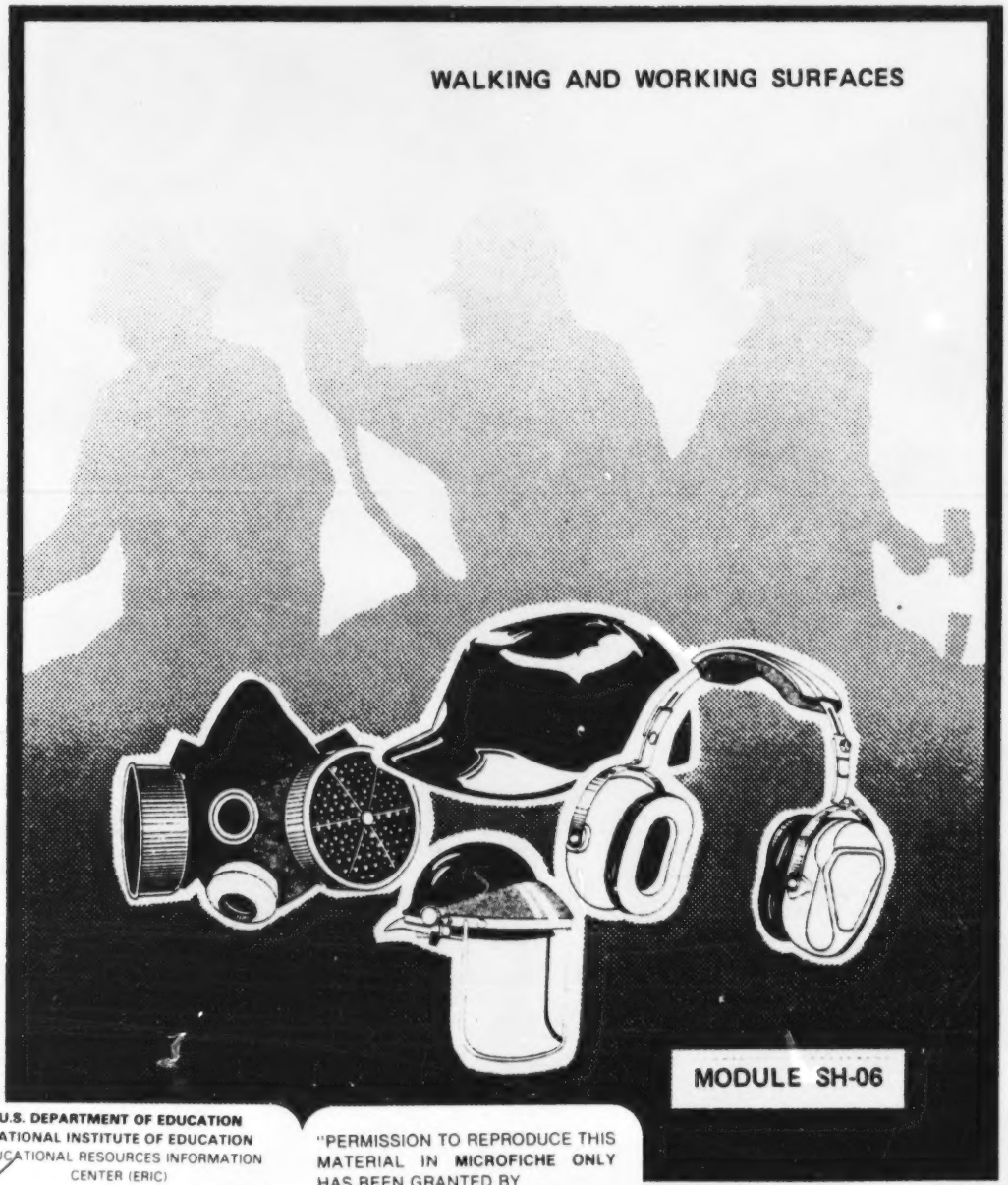
SAFETY AND HEALTH

WALKING AND WORKING SURFACES



MODULE SH-06

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INTRODUCTION

Walking and working surfaces are an unavoidable part of every person's daily life. One does not have to be an industrial plant worker to be concerned with the hazards that such surfaces may present. Many of the safety standards and good housekeeping procedures that have been established for industrial workers should also be followed by the office worker or the homemaker to ensure safe work areas. For example, using a ladder safely is just as important at home as it is on the job.

A great number of the safety standards that apply to walking and working surfaces could be considered common sense. Although studying the standards that apply to specific surfaces is important, all such regulations must be practiced in order to achieve high standards of safety and health in the workplace.

Knowing what to look for and what to avoid is the key to safety for any walking or working surface. Workers who recognize hazards and help employers correct them can make the difference between a dangerous workplace and a safe one.

This module will describe safety requirements for floors, stairways, ladders, and scaffolds, as well as OSHA standards for the construction, use, and maintenance of each of these. Requirements that pertain to exits will be presented, including the proper marking of exit routes and doors.

OBJECTIVES

Upon completion of this module, the student should be able to:

1. List four reasons why debris and clutter in the workplace are hazardous. (Page 3)
2. List two signs of an overloaded floor. (Page 5)
3. Define the rules governing structural guarding of elevated working surfaces and floor and wall openings. (Page 7)
4. List at least five characteristics of safe stairways. (Page 10)
5. List the three types of locations where exit signs must be posted. (Page 12)

6. Name two reasons why ladder rungs must be evenly spaced no more than 12 inches apart. (Page 13)
7. List 10 unsafe practices that should be avoided when using ladders. (Page 15)
8. Name four types of protection that can be used with fixed ladders to interrupt a worker's fall. (Page 17)
9. Name two reasons why scaffolds are particularly dangerous walking and working surfaces. (Page 19).

OBJECTIVE 1: List four reasons why debris and clutter in the workplace are hazardous.

Of all the injuries that occur in the workplace, one-fifth are due to falls. Each year, approximately 500,000 persons are injured in falls on the job. Three thousand of these people die or suffer a permanent total disability — meaning they will never work again. Three thousand suffer a permanent partial disability. This group will work again — but will always be limited or handicapped.

Falls can be grouped into two classes: (1) falls on the same level, due to slipping or tripping, and (2) falls from one level to another, such as from stairs, ladders, platforms, and scaffolds.

Housekeeping is one of the most important factors to be considered in preventing accidents due to falls. Most falls that occur on the same level are caused by hazardous floor conditions resulting from poor housekeeping. When spills, such as oil and grease, are not promptly cleaned up, they produce a slippery surface — the main cause of floor accidents. Likewise, when debris is left to accumulate in the work area, it creates a hazard; someone could trip and fall.

Figure 1. Poor housekeeping contributes to a high accident frequency rate.

To help protect against accidents from slipping, as illustrated in Figure 1, spills should be cleaned up immediately. Even spilled coffee can present a slipping hazard.

Drip pans, gutters, or splash guards should be used in areas were dripping occurs frequently.

Floors around work areas should be kept free of substances such as sawdust that can cling to the bottom of a worker's shoes and create a slippery surface on dry floors.

If floors cannot be kept dry because of the nature of the work performed on them, then employers must provide certain safeguards against the hazard, such as proper draining of the floor through the use of grates, platforms, mats, or false floors. Employees should be encouraged to wear shoes with grip soles and to use caution when walking on damp surfaces.

Because the natural properties of any surface will change substantially when employees track in mud and dirt, floors should be vacuumed and cleaned often.

Another major type of fall on the same level is tripping over an object. Tripping accidents occur because debris has been left lying about the workplace or because the floor has not been maintained properly. Floors that have developed cracks, splinters, ruts, or holes in the surface will eventually cause someone to trip. Tools or materials that have been left lying about the workplace also present tripping hazards.

According to OSHA safety and health standards (29 CFR 1910), trash and liquid waste must be stored in containers that are equipped with covers. It is especially important that flammable wastes such as oily rags, paints, thinners, solvents or harmful dusts not be allowed to accumulate as they are potential fire hazards.

Lumber that accumulates during a construction job can cause a worker to trip, or it may contain protruding nails or jagged edges that can puncture an employee's foot. Debris and clutter left lying about the workplace can also block exits, thereby causing many lives to be lost during emergency evacuation.

ACTIVITY 1:*

List four types of debris and clutter in the workplace and the types of accidents that they may cause.

1. _____
2. _____
3. _____
4. _____

OBJECTIVE 2: List two signs of an overloaded floor.

Workers can spot most potential hazards associated with slipping or tripping accidents, but one hazard that is not quite so apparent is that of the improper loading of floors. When a building is constructed under accepted engineering practices, the maximum load limit that a floor can carry is specified. The load limit, stated in terms of capacity per square foot, must be posted in the work area in a conspicuous place, and the limit must not be exceeded.

Buildings, like floors, are also designed to carry a uniform load. This means that the load limit must be distributed uniformly over the entire floor, not concentrated in one area. Concentration of the load will weaken the structure of the floor. Figure 2 illustrates the fundamentals of floor loading. In Figure 2a, the load is distributed uniformly over the floor area. In Figure 2b, the same load is concentrated at the center of the span between columns. This placement has exceeded the square foot capacity. When a load is concentrated at the center, it requires twice the structural strength. Conversely, if a floor is designed for a given load, only one-half of this amount can be concentrated at the center of the span. Figure 2c shows a proper placement of aisles and loads.

In areas where heavy machinery or equipment is used, overloading can be reduced by placing the heavy equipment over beams or girders, which will give additional support.

*Answers to Activities appear on page 21.

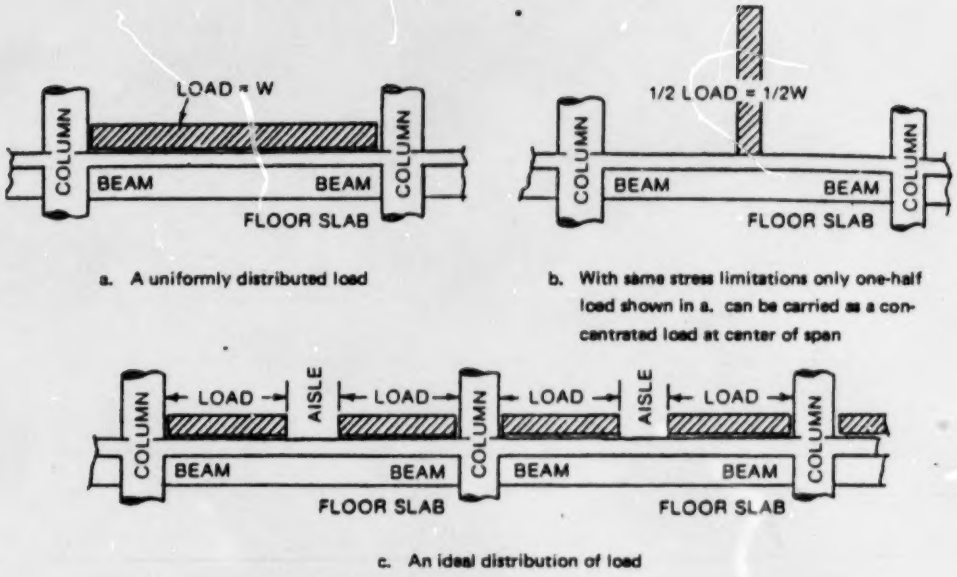

Figure 2. Various types of floor loading.

In areas where large numbers of people gather, persons in charge should be aware of potential floor overloading. Uneven weight distribution and the added stress from dancing or foot-stomping can cause collapse of floors. The 1981 collapse of a hotel balcony in Kansas City, Missouri, was a tragic illustration of floor overloading — 216 people were killed. (While the reasons for the collapse are not fully understood at this time, overloading did occur.)

There are two main signs that indicate an overloaded floor: (1) the supporting members, such as walls, beams, or columns will be cracked or chipped and (2) floorboards will be broken or splintered. If the beams or columns are wood, they will contain cracks. Concrete beams will contain pits where concrete has chipped and fallen away. Concrete columns will be chipped and concrete will have pulled away from reinforcing rods. Brick walls will show signs of cracking, of disintegration of the bricks, and of pulling away from the floor.

Any evidence that a floor might be overloaded should be reported to the employer immediately. Employers must eliminate overloading and repair structural damage promptly.

ACTIVITY 2:

1. List the two major signs of an overloaded floor.
   a. _____
   b. _____
2. Mark true or false.
   _____ As long as the floor load limit is properly respected, there is no danger of floor overloading.

OBJECTIVE 3: Define the rules governing structural guarding of elevated working surfaces and floor and wall openings.

Many times it is necessary for employees to work on surfaces that are elevated (situated above the regular floor) such as platforms, runways, and open-sided floors. Working above the floor presents two particular hazards of which the worker must be aware: (1) falling and (2) knocking tools or objects from the top level onto workers below. When a working surface is four or more feet above floor level, employers are required to erect guardrails with a toeboard, or equivalent protection, around the area. Guardrails with toeboards must also be provided for any open-sided floor, walkway, platform, or runway — regardless of height — that is located above or adjacent to moving machinery, electrical equipment, or open tanks.

Guardrails should be made from wood, pipe, or structural steel. Fiber and wire rope can sag below minimum safe height and "give" if someone leans against them, so these materials should not be used for guardrails. The top of the guardrail must be at least 3 1/2 feet high. Midrails must be located between the floor surface and the top rail to protect an employee who might be working under the level of the top rail or to protect wheelchair-bound employees from falling. The guardrail must be supported by vertical posts placed no more than eight feet apart and must be able to withstand 200 lbs of pressure applied to the top railing. Safe dimensions for guardrails are provided in Figure 3.

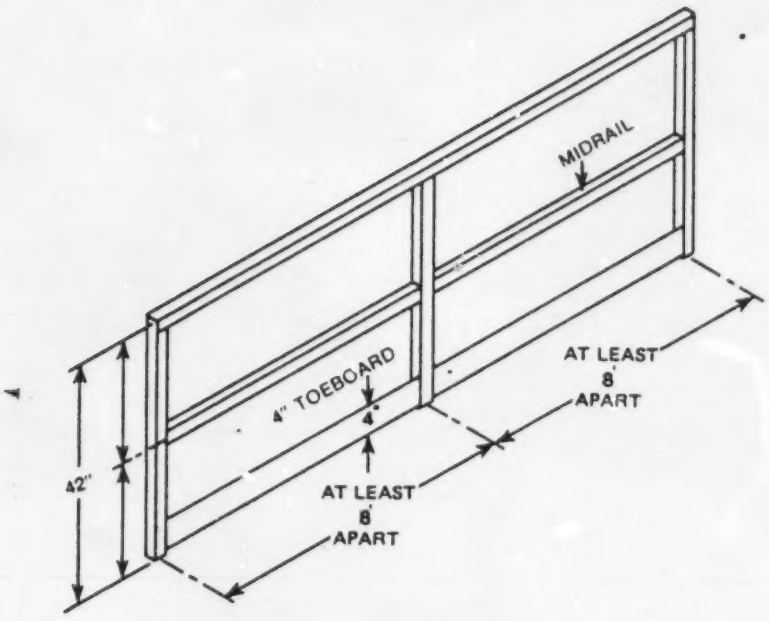

Figure 3. Guardrail with midrail and toeboard.

A toeboard is a four-inch high barrier installed at platform level along all exposed sides and ends of a platform. Toeboards reduce the danger of materials being knocked off the platform and striking workers on the lower level and must be installed wherever there is a hazard of falling materials.

When a load is piled too high for the toeboard to give protection to the worker below, paneling or screening must be installed. The screening must reach from the floor to the top of the guardrail or to the ceiling, depending on the height of the load.

All floor and wall openings in the workplace must be guarded when the opening is low enough that workers might fall through it or drop materials through it. When providing protection for hatchways, chutes (sloping passageways through which things may travel to floors below), trap doors, manholes, and ladderways leading to lower levels, a floor-hole cover is more suitable than a guardrail. The cover should be hinged in place and closed when the opening is not being used. While in use with the cover open, the opening should be either attended (guarded) by a worker or protected by standard railings.

OSHA standards require that the following openings be guarded:

- Floor hole – an opening of not more than 12 inches in its least dimension, through which materials but not persons can fall (such as a belt hole or pipe opening).
- Wall hole – an opening less than 30 inches high and of unrestricted width in any wall or partition (such as a ventilation hole).
- Wall opening – an opening at least 30 inches high and 18 inches wide, through which a person might fall (such as a chute opening).
- Floor opening – an opening 12 inches or more in its least dimension in any floor, platform or pavement, through which a person might fall (such as a stair or ladder opening, a pit, or a manhole).

It is most important to remember that any opening is hazardous if it is large enough for a person or an object to fall through. All such openings should be carefully and constantly guarded, either by structures or personnel.

ACTIVITY 3:

(Fill in the blank.)

1. When a working surface is ___ feet or more above floor level, employers must erect guardrails with a _____ around the area.
2. Neither fiber or wire rope is suitable material for guardrails because each _____.
3. Guardrails are needed around platforms of any height if the platform is next to _____ _____, _____, or _____.
4. When providing protection for hatchways, chutes, trap doors, manholes, and ladderways leading to lower levels, a _____ is more suitable than a guardrail.

OBJECTIVE 4: List five characteristics of safe stairways.

Providing safe passage from one level to another is a concern in industry, at the office, and at home. Many serious injuries result from slips, trips, and falls on stairways; therefore, reducing these hazards should be a primary objective.

Anytime persons must move from one level to another, some means of access must be provided. The access may be fixed stairways, fixed ladders, or portable ladders, depending upon the situation.

Fixed stairways are necessary when travel between levels is done on a regular basis. Ladders, ramps, or temporary stairs are often used in buildings being constructed, repaired, or altered.

Usually one can determine whether a stairway is solidly built by just looking at it. An unsafe stairway should never be used. A fixed stairway must be able to carry at least five times the normal anticipated load but never less than a concentrated load of 1000 pounds.

A fixed stairway must have a minimum width of 22 inches unless it is a means for, or provides access to, an exit. Then the minimum width is 28 inches. Vertical clearance from stair tread to the ceiling overhead should be at least seven feet. If the stairway provides access to an exit, the vertical clearance must be seven and one-half feet.

Long flights should be broken up with platforms or landings for resting spaces because climbing a long flight of stairs can cause a person to tire, thus increasing the possibility of a fall. Landings also limit the distance of any fall that occurs. All landings must be at least as wide as the stairway and two one-half feet long.

Fixed stairways should be installed at a 30 to 50 degree angle in relation to the floor. Figure 4 illustrates the proper dimensions for a fixed industrial stairway.

To reduce the hazards of slipping and stumbling, the riser height and tread width of a stairway should be uniform throughout the flight of stairs. All stair treads should be slip-resistant. Slippery substances such as oil,

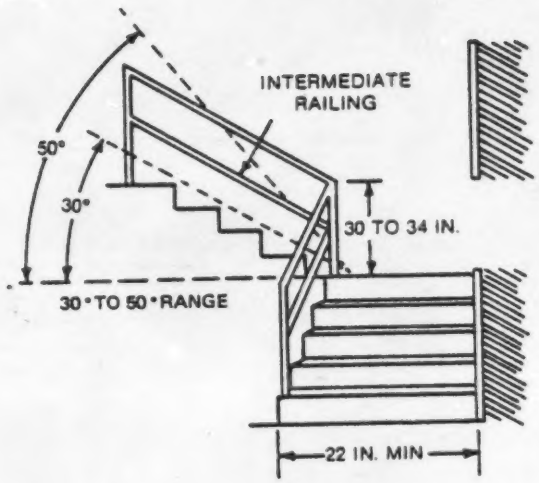

Figure 4. Safe dimensions for a fixed industrial stairway.

grease, snow, or mud should be removed from the stair immediately. One method of decreasing the hazard of built-up ice and snow is to use open-grating style treads that allow moisture to drain.

Further protection from falling accidents on stairways is provided by using guardrails. OSHA requires the use of standard guardrails on any open side of a stairway and on at least one side – preferably on the right side descending – of any enclosed stairway. If a stairway is unusually wide, it may require one or more center rails, depending upon the width of the stairway. A guardrail should always be within easy reach of anyone using the stairway.

Stairway handrails should be rounded to provide a good handhold, and they should be smooth on the surface to prevent hand injuries. The ends of the rails should be turned into the supporting wall to prevent a projection hazard. For proper structural support, the brackets attached to the rail and wall should be no more than eight feet apart. To prevent hand injuries there must be a clearance of at least one one-half inch between the handrail and wall.

ACTIVITY 4:

1. Name two reasons why stairways should have landings or platforms.
   a. _____
   b. _____
2. When should stairs be wider than 22 inches? _____
   _____

3. (Fill in the blank.)

   a. All stair treads should be _____ resistant.

   b. _____ should be provided on all open sides of stairways.

OBJECTIVE 5: List the three types of locations where exit signs relating to exits must be posted.

Being able to evacuate a jobsite quickly and safely is an important aspect of job safety. Any workplace, building, or structure must be designed with enough exits to allow everyone inside to escape quickly in case of a fire or other emergency. There must also be enough ramps to provide a safe exit for persons in wheelchairs.

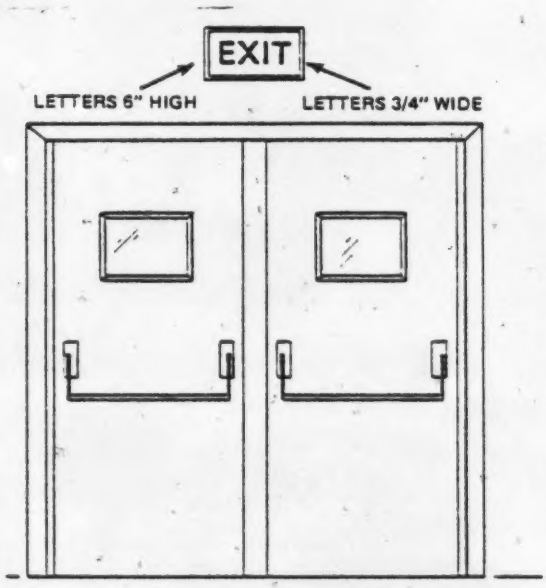

Figure 5. A clearly marked exit.

Each exit, as well as the routes to the exit, must be clearly marked, as illustrated in Figure 5. The letters must be at least 6" high and 3/4" wide and plainly legible. An exit sign should be distinctive in color so that it does not blend in with the color of the interior finish. Exit signs must also be placed in every location where the direction of travel to reach the nearest exit is not obvious. Exits and all exit signs should be well lighted to eliminate confusion as to their locations during an emergency evacuation. Doors, hallways, and stairs that do not lead to an exit also should be marked with a sign saying "Not an Exit," to prevent someone from getting trapped.

All routes to an exit, such as hallways, and stairs, must be clearly marked and well lighted. The minimum width of any access to an exit, such as a doorway or hallway, is 28 inches. An exterior route to an exit, such as a balcony or porch, must have a smooth, level floor and be equipped with guardrailing on all open sides. An exterior route should also be covered with a roof to keep it free of snow and moisture that would present a slipping hazard.

The exits themselves should be kept free of obstructions at all times. Safe evacuation depends upon good housekeeping practices in the workplace. Loading and unloading, temporary storage, bicycle parking, trash disposal, and decorative objects such as plants or mirrors should not be allowed to block exits. The time it takes to stop and unlock a door could cost a life. Exit doors should hinge on the side instead of a center post and always open out. Panic hardware (door latch bars that give way to pressure) is preferred on exit doors. Many lives have been lost in emergencies when people have panicked and trapped themselves against a door that opened inward. All exits must open directly to a street, a yard, or to another open space that allows the persons exiting ample room to get a safe distance from the building.

ACTIVITY 5:

List the three places where signs relating to exits must be posted.

1. _____
2. _____
3. _____

OBJECTIVE 6: Name two reasons why ladder rungs must be evenly spaced no more than 12 inches apart.

Ladders are common tools used in almost every workplace. A ladder is a simple device, but it can be very dangerous if it is not made, used, and cared for properly.

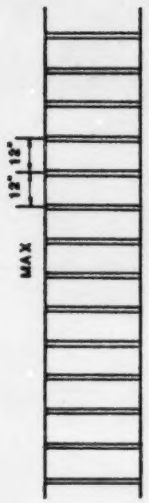

Figure 5. Ladder construction.

Ladders can be either portable or fixed (permanently attached to a structure). Ladders can be made of wood, metal, or fiberglass.

There are general safety standards that apply to the construction of all ladders, regardless of type. For example, as illustrated in Figure 6, all ladders must have steps, rungs, or cleats that are parallel, level, and evenly spaced no more than 12 inches apart. Uniformity of rung spacing on any ladder is important for two reasons: (1) without it a worker cannot anticipate where the next step is, and (2) some workers have trouble reaching steps more than 12 inches apart.

Specific requirements for design and construction (other than the one regarding spacing of rungs) have not been set for portable ladders because of the wide variety of materials and design possibilities. Fixed ladders, however, must be able to support a minimum, single concentrated load of 200 pounds. OSHA specifices also that the ladder produced or used must be free of structural defects or accident hazards such as sharp edges, splinters, and so on.

A ladder must never be used if it is damaged. To ensure against this, ladders should be inspected regularly for weak places. Knots, bark pockets, and green cracks indicate weak spots on wooden ladders; and rust and corrosion are signs of weak areas on metal ladders. If a ladder has been damaged it should be repaired immediately and <u>properly</u> — never in a makeshift fashion. If a ladder cannot be repaired properly, it should be destroyed to prevent its use.

To ensure safety when ascending or descending a ladder, a person should always face the ladder and hold on to the side rails with both hands. Nothing should be carried when one is climbing or descending a ladder. If material must be handled, it should be raised or lowered with a rope before one ascends or descends.

ACTIVITY 6:

Name two reasons ladder rungs must be evenly spaced no more than 12 inches apart.

1. _____

_____

2. _____

_____

OBJECTIVE 7: List 10 unsafe practices that should be avoided when using ladders.

The two main types of ladders, whether wood or metal, are portable and fixed. As the names imply, a portable ladder is one that can be carried about from one job to another, whereas a fixed ladder is one that remains permanently attached to a structure.

Taking proper precautions when placing a portable ladder will significantly reduce the possibility of a falling accident. For example, a ladder should never be placed in front of a door that opens toward the ladder, or be placed against a window pane that might break. A ladder should never be leaned against an unsafe backing, such as loose boxes or barrels that can slip or roll. Securing the top of a ladder to a fixed structure will prevent the ladder from slipping.

Sound footing is necessary for all portable ladders. Both feet of a portable ladder should be placed on a solid, level base — never on a movable object or on soft ground into which the ladder might sink. As illustrated in Figure 7, several of the common causes of falls from ladders are the following:

- Reaching too high or too far to one side.
- Walking down the ladder facing away from the ladder.
- Standing on the top rung.
- Slipping because of oily, slick shoes.
- Leaving tools on the rungs of the ladder.

Figure 7. Misuse of ladders can be hazardous.

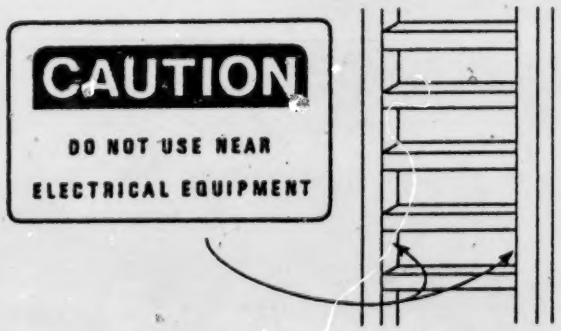

Figure 8. Electrical hazard decal.

Another point to remember when working with portable ladders is that a ladder is designed to be used in a nearly vertical position and cannot be used safely in a horizontal position. Therefore, it should never be used as a runway or scaffold.

Short ladders should never be spliced together. They are designed for use in their original lengths and are not strong enough for use in greater lengths.

Wooden ladders, not metal ladders, must be used around electrical circuits or in places where the ladder can come in contact with such circuits. Metal ladders will conduct electricity; therefore, they present the possibility of electric shock. The danger of this electrical hazard cannot be overemphasized. Metal ladders should be clearly marked with decals warning against their use near electrical equipment, as illustrated in Figure 8.

ACTIVITY 7:

1. List five practices that should be followed in choosing and placing a ladder.

   a. _____

   b. _____

   c. _____

d. _____

e. _____

2. List five common causes of falls from ladders.

a. _____

b. _____

c. _____

d. _____

e. _____

OBJECTIVE 8: Name four types of protection that can be used with fixed ladders to interrupt a worker's fall.

A fixed ladder more than 20 feet high must be used with some means of breaking a fall in case a worker loses his or her balance. This protection can be provided by one of four methods: a cage, a well, a ladder safety device, or a platform landing.

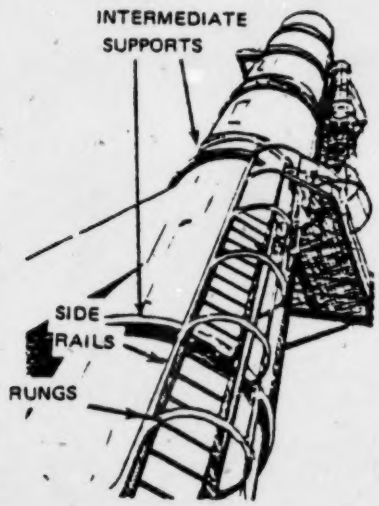

Figure 9. Fixed ladder with cage.

A cage is an enclosure that is fastened to the side rails of a fixed ladder. The cage encircles the climbing space of the ladder, as shown in Figure 9. The cage must begin seven to eight feet above the ground, a distance that is close enough to the ground to protect the worker if he or she falls and yet high enough to allow persons or vehicles to pass under the cage. The cage must extend three one-half feet above the top of the structure in order to protect the worker until he or she is safely on the landing.

A well is a permanent enclosure around a fixed ladder. The ladder is attached to the walls of the well. The well gives workers basically the same type of protection as the cage. Both the cage and well must have enough room for the worker to move up and down easily.

A ladder safety device is any device other than a cage or well that will reduce the possibility of an accidental fall. A safety belt with some type of friction brake is one ladder safety device. If a climber wearing such a safety belt slips, the friction brake immediately catches and holds the climber, stopping the fall.

Figure 10. Safety devices can catch and hold the climber, breaking the falls.

A safety device is only good, however, when the climber is wearing it. Consequently, unless both the employer and the worker conscientiously enforce the wearing of safety belts or harnesses (see Figure 10), the worker will be better protected by a cage.

Another safety feature of a fixed ladder is the landing platform. Such a platform provides a means of interrupting a free fall and serves as a resting place during long climbs. A landing platform must be provided every 30 feet for caged ladders and every 20 feet for unprotected ladders (when no safety device is used). All landing platforms must be a minimum of 24 inches wide and 30 inches long and must have standard railings and toeboards.

ACTIVITY 8:

(Fill in the blank.)

1. A fixed ladder over 20 feet high must have _____ _____ as a means of breaking falls, or for resting during long climbs.
2. A _____ or _____ provide a means of breaking a worker's fall by encircling the climbing space.
3. A safety belt with a _____ _____ can catch and hold a falling climber.

OBJECTIVE 9: Name two reasons why scaffolds are particularly dangerous walking and working surfaces.

Scaffolds are temporary, elevated platforms that are used to support workers, materials, and equipment. They can range in size from a small wooden platform erected by a painter to reach the upper story of a house to a highly sophisticated, powered suspension platform for use in high rise construction. Scaffolds, regardless of size, have several characteristics in common that cause them to be particularly hazardous working surfaces. First, scaffolds can be extremely dangerous if they are improperly constructed, misused, or poorly maintained. Second, scaffolds are often used at great heights; therefore, the most common accident involving scaffolds is a fall to a lower level. Such falls usually result in a serious injury.

A more complete discussion of safety requirements for particular scaffold types can be found in Module SH-22, "Ladders and Scaffolding Safety." This module will present only the general safety requirements that apply to the use and maintenance of all scaffolds.

The planks that make up the platform of a scaffold must be secured, and their edges must be laid close together to prevent tools from falling through and striking someone below. If workers on a scaffold are exposed to falling objects, an overhead protection of planking or other suitable materials must be provided. Guardrailing with a top rail, midrail, and toeboard must be provided around the open sides of any elevated working platform (including a scaffold). These railings ensure maximum safety to persons both on and below the platform as shown in Figure 11. All scaffolds must be built to safely support the maximum load intended.

Occasionally, scaffolds can be reached from adjacent floors. When this is not the case, a safe and convenient means of access, such as a ladder, ramp, or stairway, must be provided.

Proper use of scaffolds includes taking precautions when electric power lines are nearby, when slipping and tripping hazards are present, and when material is being hoisted onto the platform. To avoid serious injury or death from electrocution, workers should always make sure the electricity has been turned off before placing a scaffold where it might come in contact with power lines.

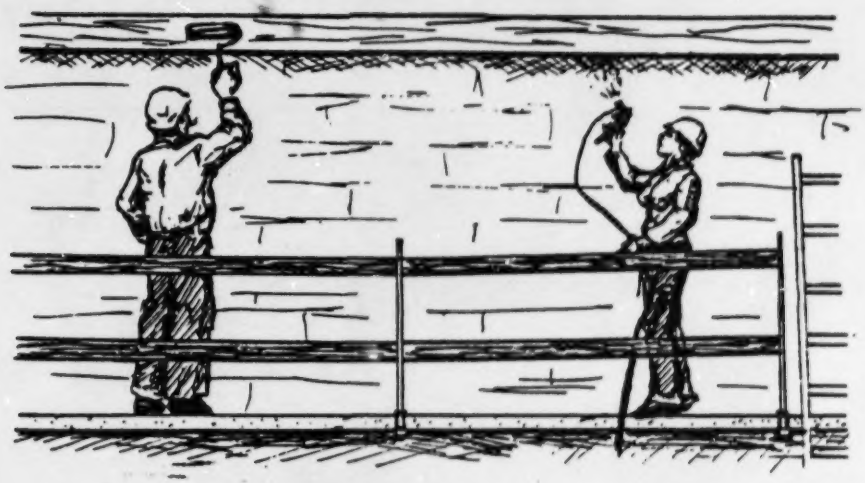

Figure 11. Guardrailing required on elevated platforms.

Slipping and tripping hazards are greatly reduced if the surface is kept clean and dry, as well as clear of tools, materials, and debris. One should never work on a scaffold that is covered with ice or snow nor attempt to use a scaffold during storms or high winds.

When materials are being hoisted onto the scaffold, a line should be attached to the load to safely control it so that the materials do not strike a worker or damage the scaffold.

The importance of proper maintenance of scaffolds cannot be over-emphasized. Collapsing scaffolds usually result in very serious injuries. Because of the inherent danger, scaffolds should be inspected frequently for rust, straightness of the members, (the boards or the pipes) damaged welds, or condition of the wood. Unsafe scaffolds should be removed from the worksite for disposal if they cannot be properly repaired.

ACTIVITY 9:

Mark each of these statements true or false.

____ 1. Scaffolds are permanent structures.

____ 2. The most common accident involving scaffolds is a fall to a lower level.

____ 3. Electricity should be turned off wherever scaffolds may come in contact with power lines.

____ 4. Scaffolds may be worked on during high winds if they are properly secured.

____ 5. Materials that are being hoisted onto a scaffold need to be guided with an attached line.

REFERENCES

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National Safety Council. Accident Prevention Manual for Industrial Operations. Chicago, National Safety Council, 1974.

U.S. Department of Labor. OSHA Standards for General Industry, CFR Part 1910. Washington, DC: U.S. Government Printing Office, 1978.

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ANSWERS TO ACTIVITIES

ACTIVITY 1

1. Tools or materials – tripping hazard.
2. Lumber with nails – puncture or tripping hazard.
3. Spills such as oil or grease – slipping hazard.
4. Oil rags, paints, shinners, solvents and some dusts – fire hazard.

ACTIVITY 2

1. a. Cracks in supporting members, such as walls, beam, or columns.
   b. Broken or splintered floorboards.
2. True.

ACTIVITY 3

1. Four; toeboard.
2. Sags.

3. Moving machinery, electrical equipment, or open tanks.
4. Floor-hole cover.

ACTIVITY 4

1. a. To provide resting places.
   b. To limit the distance of any falls.
2. When they are a means for, or provide access to, an exit.
3. a. Slip.
   b. (Standard) guardrails.

ACTIVITY 5

1. a. Every exit.
   b. Every route to an exit.
   c. Every door, passageway, or stairway that might be mistaken for access to exits.

ACTIVITY 6

1. Without it, a worker cannot anticipate where the next step is.
2. Some workers could have trouble reaching steps more than 12 inches apart.

ACTIVITY 7

1. a. A ladder should never be placed in front of a door or window that opens toward the ladder.
   b. A ladder should never be placed against a window pane that might break.
   c. A ladder should never be leaned against loose boxes or barrels that can slip or roll.
   d. Both feet of a portable ladder should be on a solid, level base.
   e. Metal ladders should never be used around electrical circuits.
2. a. Reaching too high or too far to one side.
   b. Walking down the ladder facing away from the ladder.
   c. Standing on the top rung.
   d. Slipping because of oily, slick shoes.
   e. Leaving tools lying on the rungs of the ladders.

ACTIVITY 8

1. Landing platforms.
2. Cage; well.
3. Friction brake.

ACTIVITY 9

1. False.
2. True.
3. True.
4. False.
5. True.